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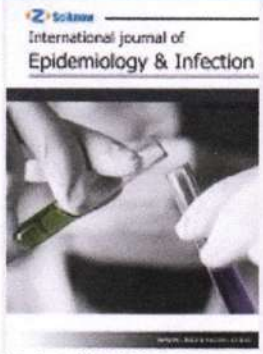

Print ISSN: 2331-8236 Online ISSN: 2331-8244

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Author(s): Dina F Rosyada, Rustaman Riha, Ririh Yudhastuti, Bambang G Irianto, Hari B Notobroto

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doi: 10.12966/ijei.02.01.2014, February 2014, v.2, p. 1-6

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International Journal of Epidemiology & Infection

IJEI 2014, 2(4):71-74
DOI: 10.12966/ijei.11.02.2014

Contaminated Water and Leptospirosis Infection on Society in Endemic Area Kabupaten Sampang Madura

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Abstract - The great climate for leptospira development is warm air and humid soil. This situation can be found commonly in tropical country, such as Indonesia. This disease is found in area which is contaminated by urine from *Leptospira* bacteria infected animal. Case in Indonesia is found again on April 2013 until mid-2014 in Kabupaten Sampang Madura. From that finding, Sampang is confirmed as endemic area of leptospirosis. This research aimed to analyze the influence of contaminated water, home sanitation and health behavior on *Leptospira* infection in society in Kabupaten Sampang Madura. Data were collected from laboratory examination on mouse sample and puddle, interview and observation. This research used analytical observational with case control design. The number of sample were 7 case area and 21 control area (1:3), each of them used 10 inhabitants. Data were analyzed with univariate and multivariate used logistic regression test. Dominant factor that influenced leptospirosis was flood track record (OR=2, 89; p=0,001). Environmental health management with rodent monitoring, waste water pipeline handling which related to rainwater are some efforts which can be used in controlling leptospirosis program plan in Kabupaten Sampang Madura.

Keywords - Leptospirosis, Endemic, Contaminated Water

1. Introduction

Zoonoses are diseases that can naturally vertebrata transferred from animals to humans or instead. Leptospirosis is an infectious disease caused by a bacterial pathogen called Leptospira, which is transmitted directly or indirectly from animals to humans so it is included in zoometric diseases. (WHO, 2003) The area around South East Asia was reported as leptospirosis endemic areas. Countries have reported outbreaks record leptospirosis cases namely India, Indonesia, Sri Lanka and Thailand. Areas with specific climate, many populations and the increased contact between humans and animals (infected with Leptospira bacteria) contribute to maintaining the high transmission of leptospirosis in Southeast Asia. Data from the International Leptospirosis Society (ILS) states that Indonesia is one of the tropical countries with relatively high leptospirosis deaths, which ranged between 2.5% - 16.45% or an average of 7.1% and including three ranked in the world for mortality (Levett, 2001).

Based on the Sampang Health Service In April 2013, concerning the existence of cases of leptospirosis in the post-flood Sampang since April 2013 showed a significant increase in the number of cases and deaths have an impact occurs. Case rediscovered in 2014, there were 51 reported patients with clinical symptoms of leptospirosis are treated to Sampang Hospital (BBTKL & Surabaya, 2013; Sampang Health Service, 2014). The layout of the areas that have a lot more people with leptospirosis in the villages those are in the town of Sampang by neighborhood mostly from Gunung Sekar, Banyu Newer, Kamoning, Central Rong, Dalpenang, Polagan and Aengsareh.

Based on leptospirosis outbreaks that have occurred in Sampang district, there is a big possibility Leptospira bacteria present in the environment in the endemic areas. Environmental health research associated with Leptospira bacteria contamination in water puddles, behavioral factors, home sanitation factors and the existence of mice infected with the bacterium Leptospira in endemic areas. Expected to be useful in seeing how the trend of leptospirosis cases in the future further consideration early awareness program in leptospirosis cases to make a control of the management of environmental health.

2. Research Methods

This research is an observational analytic study with case control design. The population used in this study is the population of cases and controls. The case population is a population case District / Village in Sampang contained leptospirosis patients. Population control is the village / village in Sampang that there were no people with leptospirosis. Control sample is the urban / rural in Sampang who do not have people suffering from leptospirosis. The sample size of this study using a comparison group of cases and controls was 1: 3. Large sample of cases was 7 District / Village and control sample size is 21 District / Village so that the samples in this study were 28 District / Village. Control samples in this research were 21 District / Village. The sample area of a District / Village in this study consisted of residents and homes as well as water samples taken from several points in each District / Village. In the variable characteristics of the region, home sanitation and health behaviors were taken from each District / Village and house 10 people, so arrange people and houses representing District / Village as the sample is 70 cases and control samples was 210 In water samples taken each 7 cases each sample areas of ponded water samples and the control sample areas were 21 water samples taken from several points. In the sample of rat trapping rats performed in some areas the number of leptospirosis cases or patients the most. Each respondent was interviewed with on the sample questionnaire interviews and observations sanitation of their home. The observation data includes water supply, type of wastewater disposal, any trashcan, marks the rat, gutter distance to home and the presence of components of the ceiling in the house in samples taken rat kidneys for leptospires laboratory tested. Samples of water puddles and kidneys of mice tested using polymerase chain reaction method.

3. Results and Discussion

Sampang on Madura is a district that is in the north eastern part of the island of Java. Overall Sampang District has a total area of 1233.30 km2. The total population of Sampang is 1,008,799 people. The number of samples from 28 regions consists of 280 respondents. Data characteristics of respondents by education last majority were primary school graduates (35.7%), the majority of the female gender of respondents (53.9%). Most respondents aged 31-40 years (34.6%) and job majority of self-employed respondents (85.7%). Average income of respondents is Rp 600,000/ mouth.

Table 1. Cross-tabulations variable of behavioral factors, the majority of the population sanitation factors and results of laboratory samples of rats and water puddles with the type of case and control region

Variable	Region		Value	p
	Case (n=7)	Control (n=21)		
Water contamination and positive Leptospira mouse				
-Positive	6 (50%)	6 (50%)	4.861	0.027
-Negative	1 (6.3%)	15 (93.8%)		
Flood track record				
-Ever floods	6 (100%)	0 (0%)	18.101	0.000
-Never floods	1 (4.5%)	21 (95.5%)		
Used protector at home				
-Never	0 (0%)	4 (100%)	0.389	0.533
-Always	7 (29.2%)	17 (70.8%)		
Used protector in working habit				
-Never	0 (0%)	16 (100%)	9.528	0.002
-Always	7 (58.3%)	5 (41.7%)		
Working place				
-Outdoor	0 (0%)	17 (100%)	11.23	0.001
-Indoor	7 (63.6%)	4 (36.4%)		
Place to bath				
-River	0 (0%)	8 (100%)	2.1	0.147
-Bathroom	7 (35%)	13 (65%)		
Place to washing tableware				
-Washing dishes in the kitchen	7 (41.2%)	10 (58.8%)	4.043	0.044
-Outdoor	0 (0%)	11 100%)		
Frequent presence of rat				
-Yes	7 (25%)	21 (75%)	2.222	0.400
-No	0 (0%)	0 (0%)		
Having pets				

-Yes	2 (12.5%)	14 (87.5%)	1.75	0.186
-No	5 (41.7%)	7 (58.3%)		
Frequency of contact with Puddle Water				
-Seldom	7 (28%)	18 (72%)	0.124	0.724
-Often	0 (0%)	3 (100%)		
Water Supply				
-Wells	0 (0%)	21 (100%)	22.921	0.000
-Local water company	7 (100%)	0 (0%)		
Type of wastewater disposal				
-There was no	0 (0%)	15 (100%)	23.429	0.000
-Open wastewater disposal	1 (14.3%)	6 (86.7%)		
-Close wastewater disposal	6 (100%)	0 (0%)		
-Any trashcan				
-No	7 (100%)	0 (0%)	22.291	0.000
-Yes	0 (0%)	21 (100%)		
Any Marks of rats in home				
-Yes	2 (8.7%)	21 (91.3%)	13.716	0.000
-No	5 (100%)	0 (0%)		
Any Ceiling in the house				
-Yes	7 (100%)	0 (0%)	22.921	0.000

From the Table 1 shows the independent variables that have relevance to the dependent variable in this study are Water contamination and positive Leptospira mouse, flood track record, used protector in working habit, working place, place to washing tableware, supply water, type of wastewater disposal, any trashcan, any marks of rats in home and any ceiling in house.

Table 2. Bivariate Test

Variabel	OR	(95% CI)	p
Water contamination and positive Leptospira mouse	15	1.475-152.4	0.022
Flood track record	2.45	1.393-4.325	0.002
Used protector in working habit	2.78	0.878-2.485	0.004
Working place	16.24	0.856-2.468	0.042
Place to washing tableware	2.78	1.378-5.633	0.074
Supply water	1.34	0.752-2.380	0.322
Type of wastewater disposal	1.16	0.772-1.734	0.48
Any trashcan	2.69	1.462-4.945	0.051
Any marks of rats in home	1.54	0.821-2.900	0.178
Any ceiling in house	2.69	1.462-4.945	0.401

From the Table 2 shows the variables that affect the incidence of leptospirosis in Sampang are water contamination and positive Leptospira at mouse, flood track record, used protector in working habit and working place.

Table 3. Multivariate Test

Variabel	OR	(95% CI)	p
Water contamination and positive Leptospira mouse	1.64	0.876-3.200	0.176
Flood track record	2.69	1.462-4.945	0.001
Used protector in working habit	1.53	0.823-2.810	0.1
Working place	1.46	0.878-0.245	0.142

From the Table 3 shows the most variables in this research is flood track record. Variable results of laboratory tests of water

and rats have a significant effect (OR = 15.0) on the occurrence of cases of leptospirosis in the region Sampang. This indicates the presence of water contamination and mice infected by leptospira bacteria influence the occurrence of cases of leptospirosis. Urine of infected animals can contaminate the environment and as a starting point a source of transmission of leptospirosis (Supar et al., 2005; Toyokawa et al., 2011).

The results showed that area with as many as 16 cases of leptospiros is rat's more than 50% positive leptospirosis. Type mice are Suncus murinus, R. norvegicus, and tanezumi Bandicota. Rat plays an important role in the transmission of leptospirosis (Ristiyanto, 2008). Tanezumi rat is known as rat whole activities such as finding food, shelter, and breeding in the house. Rat norvegicus more often occupy waterways and are found in urban areas where in most areas of this research the case of urban areas in Sampang (Okatini et al., 2007; Raja et al., 2012). From the kidneys, leptospires are excreted in the urine and may then contimate surface water, streams and water, infection of animals or human occur from direct contact with urine or water terminated (Adler et al., 2010). Cases of leptospirosis in Sampang supported by the occurrence of flooding (OR = 2.45). Research area ever flooding has occurred at greater risk of leptospirosis, where a history of more frequent flooding during the rainy season (Mandal et al., 2011). At the time of stagnant flood water contaminated with Leptospira risk (Sarkar et al., 2002). According to the history of flooding in Sampang have a big flood in April and May 2013 and occurred again in late 2014 and early this allows for the spread of leptospira and mice infected with leptospirosis in the region of the case. While in the region is not the case of a flood never happened, so it was not a case of leptospirosis in the area despite the sanitary house has more components than the minimal region of the urban area of the case (Kusmiyati, 2005). In this study variables also have a significant effect on the wear factor footwear and personal protective equipment when working and the type of work that can be shared indoors or outdoors, using personal protective equipment when working primarily performed outdoors to minimize contact with contaminated environmental media risk Leptospira positive rat urine (Gamage et al., 2012).

Variable cutlery washing juaga is significant effect. Place to washing eating/tableware contaminated rat urine can be risk if done outside the house given the rats would be closer to the place smelled like food or water channels that carried the rat R.norvegicus.

4. Conclusion

From these results it was known that a potentially become endemic regions leptospirosis in Sampang Madura was caused dominant factor a history of flooding in the region. In never flooded areas will potentially make the spread of rat urine in one environmental medium is puddle water. It was supported by the positive rats with Leptospira. The community was expected to use personal protective equipment in the event of flooding, such as the use of boots and gloves in an attempt to minimize the risk of contact with rat urine Leptospira positive. Besides that it avoids the frequency of contact with dirty water when flooding occurs. Environment on the other hand maintained that the rodent does not easily fit in the home environment and rats monitoring is need to determine the condition of the infected rats in a region.

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